Training Dogs To Smell Off-Flavor in Catfish

STEPHEN AUSMUS (K11148-1)

With the help of veterinary student Erica Blackman, Rusty, a yellow labrador mix, trains to sniff water samples for compounds that produce off-flavors in catfish, while associate professor Larry Myers looks on. Blackman and Myers are with the College of Veterinary Medicine at Auburn University.

Off-flavor in catfish costs the industry as much as $50 million annually. But Agricultural Research Service (ARS) scientists may have found a new solution to identify the fish that shouldn't land on consumers' plates.

They're getting help from canines.

ARS researchers at the Aquatic Animal Health Research Unit in Auburn, Alabama, along with a professor and students at Auburn University, have trained dogs to detect the muddy off-flavor, which comes from algae and metabolites present in ponds in which catfish are raised. These fish are still safe for human consumption, but nobody really enjoys eating them.

Up to this point, producers used one of two tests to find affected fish. The simplest was to take some fish from the batch, cook them, and have a human eat them to see whether they taste bad or not. But that can be time consuming, and people taste food differently.

The other way is to use gas chromatography/mass spectrometry (GCMS) to measure how much of the offending compounds are in pond water. This method is accurate, but it can take awhile to get results and is rather expensive. The dogs are being trained to sniff water samples as a possible alternative to GCMS.

ARS microbiologist Richard A. Shelby has teamed up with Larry Myers, associate professor in the College of Veterinary Medicine at Auburn University. In the past 21 years, Myers has trained more than 50 dogs to detect a variety of targets, including drugs and other chemicals.

"The dogs I work with on the catfish project and the methods of training them are similar to those I use in my other research. But these dogs have the added task of ignoring the target when the levels are extremely low, for example, below 1 part per trillion." The compounds they are sniffing for occur naturally in pond water but in very low concentrations. He doesn't want the dogs to react to those levels.

Shelby and Myers choose dogs from a local animal shelter. The breed is not important, since practically every dog can be trained to learn almost any unique smell, says Myers. He does look at its health, how well it responds to humans, and whether it enjoys playing and getting treats. "Believe it or not, some dogs don't respond to treats. We need dogs that do," he says.

The device they use to train the dogs is rather simple. It's a piece of plywood with squares cut out of it. They put an outlet box—just like the ones behind the switch plates in your house—in each square. One milliliter of water is placed in a 1-inch-long, thin, plastic tube that is held in place with wire inside each box. Most of the samples are plain water, but one is the target, containing known levels of the chemicals that give catfish off-flavor.

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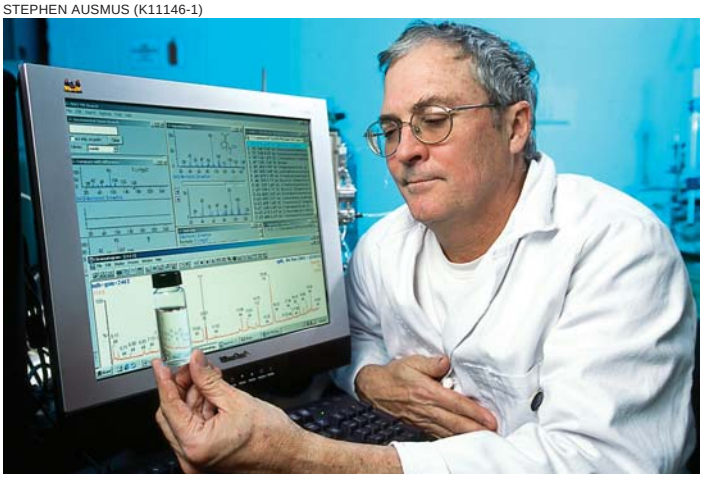

Microbiologist Richard Shelby prepares to use GCMS to analyze a water sample for chemicals that produce off-flavor in catfish.

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Larry Myers (left) and microbiologist Richard Shelby test a dog at the Lee County Humane Society to see whether the dog is a good candidate for the canine program.

The dogs start their training at 1 part per million of the compounds. "That's strong enough that most humans can smell it," Shelby says.

Auburn veterinary students help train the dogs. They take the animals to the target and teach them to sit by it. The dogs then get a treat. The students then teach the dogs to sit when they smell the off-flavor and then reward them with a treat when they do it correctly. This lasts for a few months until the dogs sit at the correct spot 70 to 80 percent of the time. The dogs are then trained to detect lower and lower concentrations. Some of the dogs are now trained to alert to off-flavor compounds at 10 parts per trillion.

Five dogs have been successfully trained so far.

"The dogs are as accurate as GCMS for detecting off-flavor, and they're quicker," says Shelby, who has conducted more than 3,000 tests. Normally, he says, water samples are sent by courier to a lab for GCMS testing, which can take a few days. But by that time, the sample may have degraded to the point that it is no longer a good representative of the pond. Also, off-flavor changes rapidly, and farmers and processors need the fast analysis the dogs can bring.

In the future, Shelby hopes to make the canine detection system practical for use on farms and at processing facilities. "Ideally, it would be great if catfish producers could take water samples from their ponds directly to their offices to get tested." By attending meetings of catfish farmers, Shelby has generated some interest in this method.

Dogs can be trained to work effectively for a few hours at a time, and their careers can last 7 years or more, according to Myers. After this, they are retired to good homes, often with their handlers.

In the late 1970s and early 1980s, former ARS scientist Charles Kiddy also worked with canines. The dogs he used had been trained to smell for explosives. Kiddy was able to retrain these dogs (with a success rate of 80 percent) to smell for estrus in cows so that timing of insemination could be improved.

Pigs too have very sensitive noses and have been trained in other sniffing capacities. But that hasn't caught on, mainly because of social factors.—By **David Elstein,** ARS.

This research is part of Aquaculture, an ARS National Program (#106) described on the World Wide Web at www.nps.ars.usda.gov.

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